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REPORT

OF

J. C. DALTON, M. D.

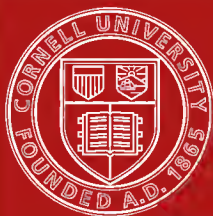
Commissioner of the New York State Agricultural Society,

FOR THE INVESTIGATION OF

ABORTION IN COWS.

PRINTED BY ORDER OF THE SENATE AND ASSEMBLY.

ALBANY:
PRINTING HOUSE OF C. VAN BENTHUYSEN & SONS.
1868.



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REPORT

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REPORT.

Mr. President, and Gentlemen of the Society:

Immediately after the appointment of the Commission for the Investigation of Abortion, in April last, measures were taken to carry out the designs of the Agricultural Society, by collecting all the facts which could throw light on the causes of Abortion and the means of its prevention. The first object of the Commission was to ascertain, if possible, the cause of the malady, by acquiring more definite information on the following points, viz: 1st. Its locality and extent; 2d. Its previous history; 3d. The number and kind of cattle affected by it; and 4th. The present condition of the dairy-farms, and the management of cattle in the affected districts.

For this purpose a list was obtained of the Officers of all the County Agricultural Societies in the State of New York, and communications were addressed to the Presidents of the Agricultural Societies of other States, requesting a list of the Officers of their respective County Societies. In this way the Commission came into

possession of the names of the Officers of County Societies in the States of New York, Massachusetts, Connecticut, Rhode Island, New Jersey, Pennsylvania, Ohio, Michigan, Illinois and Iowa. A printed letter was then addressed to these Officers, desiring a list of the Farmers in their immediate neighborhood, in the following terms:

NEW YORK, May 1, 1867.

MR.

President of the———County Agricultural Society.

Dear Sir—The New York State Agricultural Society has set on foot an investigation for the purpose of discovering the cause, and if possible the remedy, for the troublesome epidemic of Abortion among Cows, now extending over certain portions of the country. As one means of aiding in this, it is proposed to send to the farmers a Circular Letter of Inquiries (a blank copy of which is herewith inclosed), from which much valuable information is anticipated, if it can be brought to the notice of a sufficient number of those interested. May I ask of you the favor to send me a list, with name and Post Office address, of all the farmers in your county who carry on large or average sized farms for dairy or stock raising purposes, and who would be likely, in your opinion, to furnish ready and correct replies to the accompanying circular.

By transmitting such a list, with your signature, you will aid very materially in the prosecution of the work now undertaken, and render an important service to the interests of Agriculture.

Any such assistance which you may give will be thankfully received, and duly appreciated.

Yours, very respectfully,

J. C. DALTON, M. D.,

Commissioner of the New York State Agricultural Society

The foregoing letter was sent to 316 different addresses, as follows: In the State of New York, 54; Massachusetts, 25; Connecticut, 10; Rhode Island, 3; New Jersey, 10; Pennsylvania, 33; Ohio, 71; Michigan, 28; Illinois, 29; Iowa, 53.

Through this means, and by the aid of other gentlemen interested in agriculture, it became

possible to correspond directly with the farmers, and to obtain all the information which they were in a position to afford. A circular and blank form of Report, for general distribution, was then prepared, as follows :

(CIRCULAR TO FARMERS.)

NEW YORK, *May 1, 1867.*

Dear Sir—The New York State Agricultural Society has set on foot an investigation for the purpose of discovering the cause of the troublesome epidemic of Abortion among Cows, now extending over certain portions of the country. Your aid is asked in the prosecution of this work, and for this purpose the accompanying letter of inquiries has been sent to you. Will you do me the favor to fill up the proper answers in writing, at your earliest convenience, and return the same to my address, with your signature ?

By so doing you will assist very materially in the work now undertaken, and render an important service to the interests of agriculture.

Yours, very respectfully,

J. C. DALTON, M. D.,

Commissioner of the New York State Agricultural Society.

The blank form of Report, sent with the above circular, is appended to this report, marked A.

The farmers responded to this appeal with great readiness. During the summer, 4,676 of the above communications were distributed, and 1,093 replies were obtained, giving more or less complete information on the points indicated. Very few of the reports thus received were entirely complete; as it was found that circumstances made it impossible for farmers to answer all the questions comprised in them. But nearly all contained some facts which it is hoped will be of service in extending our knowledge on the subject of Abortion. The Commission would gratefully acknowledge the interest and promptitude thus manifested by the

farmers, in aiding to carry out the design of the investigation.

At the same time, Dr. WILLIAM H. CARMALT of New York city, was appointed Assistant Commissioner, and a corps of Assistant Inspectors was organized, for the purpose of visiting the farms of the afflicted districts, and thus ascertaining by direct examination such facts as could not be learned by correspondence. Each Inspector served by the month, at a salary of one hundred dollars, the necessary traveling expenses being defrayed from the funds appropriated by the Society. The names of the gentlemen who have thus acted as Assistant Inspectors, are as follows:

HENRY E. HANDERSON, M. D.; ALBERT E. HAM, M. D.; THOMAS HAIGH, M. D.; DANIEL W. KISSAM, M. D.; RICHARD F. HALSTEAD, M. D.; PHILIP E. ARCULARIUS, M. D.

Each Inspector, on commencing his tour, was furnished with a letter of instructions, to the following effect:

NEW YORK STATE AGRICULTURAL SOCIETY.

COMMISSION ON THE EPIDEMIC OF ABORTION IN COWS.

NEW YORK, May 1, 1867

To _____, M. D., *Assistant Inspector*.

Sir—In making your inquiries on the subject of Abortion in Cows, you will, on first visiting a farm, endeavor to collect and record all the information requisite for the main Report (of which the necessary blanks are furnished you); after which, you will fill out, in the same manner, the returns for the Additional Report, making both as complete and accurate as possible.

You will, in all cases, take pains to collect the desired information from the most responsible and intelligent persons to whom you can have access; and, in those instances where you are compelled to rely upon doubtful sources of information, you will exercise a careful discrimination

in regard to the same, never inserting a statement in your report unless convinced of its being made with a reasonable approach to accuracy.

In inspecting the stables where the cows are kept, you will observe, 1st, their condition as to general cleanliness; 2d, temperature; 3d, dryness or moisture; 4th, the presence or absence of uncleanly odors; 5th, the mode of fastening or confining the cows, with its effect on the animals' comfort; and, 6th, the quantity of space in each direction allowed to each cow.

Embrace every opportunity which may offer for making a thorough anatomical examination of aborted fetuses, ascertaining whether any parts of the system show indications of disease, atrophy, or imperfect development of any kind; and make a full report of each examination, with all the requisite particulars.

Examine, also, all newly-born calves which you may have an opportunity of seeing, and report whether they present any diseased or unnatural appearance; and if so, what.

Ascertain and record, so far as possible, all reliable facts which show that healthy pregnant cows are, or are not, liable to abort in consequence of seeing abortion take place in other cows; or from being exposed to any sights, odors, or emanations connected therewith.

If any opportunity should occur of making the autopsy of cows dead during pregnancy or soon after abortion, make a full examination and report of the same, especially with regard to the condition of the uterine organs.

No necessary expense is to be spared in obtaining the fullest possible information on the subject which you are to investigate. At the same time, you are relied upon to exercise a judicious economy in husbanding the resources of the Society, and to assist in this way the successful accomplishment of its work.

At the termination of each month of service, you will transmit to the Assistant Commissioner, Dr. Wm. H. Carmalt, New York, your reports for that month, together with an account of your expenses during the same period.

Yours, very respectfully,

J. C. DALTON, M. D.,

Commissioner.

Each Inspector was furthermore provided with a blank form of Report (A), similar to those distributed to the farmers, and also with blank Additional Reports, for the purpose of collecting information of a kind which the farmers could

not be expected to furnish. The form for the Additional Report is appended to this report, marked (B).

The total number of farms visited by the Inspectors has been 1,577; and the entire number of Reports thus far received, from all sources, is as follows:

Farmers' Reports.....	1,093
Inspectors' Reports.....	1,577
Additional Reports.....	1,577
Monthly and Special Reports	12
Total	<u>4,259</u>

The Reports have been received from the different States as follows:

Farmers' Reports from New York.....	494
do do Massachusetts.....	126
do do Connecticut	68
do do Rhode Island	8
do do New Jersey	6
do do Pennsylvania	84
do do Ohio	86
do do Michigan	94
do do Illinois	22
do do Iowa	105
	<u>1,093</u>
Inspectors' Reports from N. York.	1,507
Additional Reports from New York,	1,507
Monthly and Special Reports from New York	11
	<u>3,025</u>
Inspectors' Reports from Massachu- setts	70
Additional Reports from Massachu- setts	70
Monthly and Special Reports from Massachusetts	1
	<u>141</u>
Total.....	<u>4,259</u>

From all the above mentioned States, cases of abortion among cows have been reported, but it is only in New York and Massachusetts that they have been sufficiently numerous to excite general attention. In Pennsylvania they have been found to be present in Chester and Cumberland counties, where they amount to ten per cent of all the cases of pregnancy reported; but they are rare, so far as we have been able to learn, in the remaining portions of the State. In Ohio, Illinois, Michigan and Iowa, the comparative number of abortions is very small. The Commission is in receipt of a considerable number of letters from these States, in which the writers say that they can give little or no information on the subject, because the disease is "unknown," or "has never appeared" in their region of the country.

In the State of New York, information has been received from forty different counties, reporting, in all, 49,749 cases of pregnancy from May 1st, 1866, to May 1st, 1867, and 2,574 abortions in the same period. The proportion of abortions, therefore, for the entire State, as derived from these data, is only a little over five per cent; or about one abortion in nineteen pregnancies. It is evident, accordingly, that the malady is not generally prevalent, in an active form, even in New York. The returns show, indeed, that it is located in very different degrees in different parts of the State. In ten counties there was not a single abortion among 641 cows reported in calf for the year 1866-7. In twenty counties, reporting in all

19,804 pregnancies and 661 abortions, the percentage of abortions for each county varied from five per cent to less than one per cent; and in the remaining ten counties, reporting 29,304 pregnancies and 1,913 abortions, the percentage of abortion varied from above five per cent to ten per cent of the whole number of cows in calf.

There were only five counties in which the proportion of abortions was above seven per cent, viz.: *Queens*, in which it was seven and a half per cent; *Clinton*, in which it was eight per cent; *Orange*, in which it was nine per cent; *Madison*, in which it was nine per cent; and *Lewis*, in which it was ten per cent.

The following table shows the percentage of abortion, together with the number of cows and the amount of dairy products of each county, as given by the census of 1865:

STATE OF NEW YORK.					
COUNTIES.	Number of cows by census of 1865.	Pounds of butter made in 1864.	Pounds of cheese made in 1864.	Gallons of milk sold in 1864.	Percentage of abortions in pregnant cows, 1866-7.
Broome	20,696	2,291,268	113,922	41,385	0
Cattaraugus ...	30,559	2,412,223	3,635,356	12,512	7
Cayuga	21,794	2,208,049	205,155	91,511	0
Chenango	41,459	4,042,326	2,552,066	11,652	6½
Clinton	13,968	946,725	100,020	6,300	8
Columbia	11,942	965,064	23,447	231,130	5

COUNTIES.	Number of cows by census of 1865.	Pounds of butter made in 1864.	Pounds of cheese made in 1864.	Gallons of milk sold in 1864.	Percentage of abortions in pregnant cows, 1866-7.
Cortland.....	31,920	2,683,773	2,074,155	715	7
Delaware	38,525	5,052,295	35,519	6,046	0
Dutchess.....	20,014	1,358,722	11,599	8,964,574	0
Erie.....	31,859	1,558,573	3,344,734	486,206	1½
Essex	9,219	654,174	96,255	970	2
Franklin.....	15,804	1,226,598	125,732	1,100	2
Fulton.....	9,974	706,612	991,002	1,084	2
Genesee.....	9,009	763,082	80,263	104,622	0
Greene	12,059	1,327,054	16,961	2,192	3½
Herkimer.....	45,461	958,118	13,893,801	17,686	5½
Jefferson.....	55,198	3,100,234	5,348,615	278,737	3
Lewis.....	30,639	1,663,950	4,755,043	138,126	10
Livingston....	10,605	1,052,804	101,417	33,233	0
Madison.....	28,995	1,569,342	3,452,682	13,506	9
Niagara.....	11,860	966,286	52,260	25,889	3
Oneida.....	58,417	2,868,740	8,108,540	191,698	3½
Orange.....	40,096	2,363,661	132,575	8,835,052	9
Oswego.....	28,393	1,988,060	2,383,806	69,151	1
Otsego.....	36,040	2,811,199	3,335,144	18,279	3
Putnam.....	8,426	272,924	1,155	2,841,453	3
Queens.....	7,893	424,063		939,131	7½
Rensselaer....	14,302	1,144,726	528,133	556,638	0
Richmond.....	1,191	23,575		4,793	0
Saratoga.....	14,583	1,323,024	185,161	115,556	0
Schoharie.....	16,506	1,978,640	143,641	4,235	0
Seneca.....	6,470	690,428	12,331	21,394	4
Steuben.....	22,785	2,261,034	291,185	22,485	0
St. Lawrence..	65,286	5,417,779	2,922,001	119,187	4
Tioga.....	14,109	1,432,650	49,655	604	1
Ulster.....	18,561	1,547,217	1,060	134,099	0
Washington...	17,315	1,817,397	807,374	21,819	1
Wayne.....	14,256	1,320,004	90,591	47,305	1
Wyoming.....	19,499	1,279,761	1,801,781	43,407	0
Percentage of abortions throughout the State for 1866-7,...5.					

It will be seen that the largest percentage of abortions does not necessarily occur in the counties which contain the greatest number of cows, and in

which the business of the dairy is most largely productive; but it varies in this respect, in each direction. Thus in *Lewis* county, with 30,000 cows, the abortion percentage is ten per cent; in *Madison*, with nearly 29,000 cows, it is nine per cent; and in *Orange*, with 40,000 cows, it is also nine per cent. On the other hand, in *Chenango* county, with 41,000 cows, it is only six and a half per cent; in *Herkimer*, with 45,000 cows, it is only five and a half per cent; in *Jefferson*, with 55,000 cows, it is only three per cent; and in *St. Lawrence*, with 65,000 cows, it is only four per cent.

The Commission has endeavored to ascertain whether the use of the cows for producing butter or cheese were of any influence in regard to abortions. This might be the case, owing to a difference in the quality, breeding and feed of the cattle employed for these two purposes. In some instances it appeared as if the cheese producing districts were more liable to abortion than those yielding butter or milk. Thus, in *Cattaraugus* county, where the annual production of butter, according to the census of 1865, was 79 pounds per cow, and that of cheese 119 pounds, the abortions were 7 per cent of the pregnancies; in *Madison*, producing 54 pounds of butter and 119 pounds of cheese per cow, the abortions were 9 per cent; and in *Lewis*, producing 54 pounds of butter and 155 pounds of cheese per cow, the abortions were 10 per cent; while in *Niagara*, producing 81 pounds of butter and only $4\frac{1}{2}$ pounds of cheese per cow, the abortions were only 3 per cent.

In other cases, however, the results were different. Thus, in *Orange* county, producing 59 pounds of butter, with 223 gallons of milk, and only 3 pounds of cheese per cow, the abortions were 9 per cent; in *Erie*, producing 49 pounds of butter and 105 pounds of cheese per cow, the abortions were only a little over 1 per cent; and in *Herkimer*, the great cheese producing county of the State, yielding annually over 13,000,000 pounds of cheese, or 305 pounds to each cow, the abortions were only $5\frac{1}{2}$ per cent. It is certain, therefore, that no relation exists, so far as we can ascertain, between the peculiar products of the dairy and the occurrence of abortion in the pregnant cows.

With regard to the previous history of the disease, our only available information has been derived from the Inspectors' reports in the five counties of Oneida, Otsego, Herkimer, Lewis and St. Lawrence. In these counties, from the inspection of 1,507 farms, it has been ascertained that abortions have occurred, in very small numbers, as far back as the year 1852. In 1860-61 the number of reported abortions showed a marked increase, amounting in that year to 251. It continued to increase from that year to the present; the number of reported cases in successive years being as follows:

For the year	1861-62	399
do	1862-63	475
do	1863-64	742
do	1854-65	894
do	1865-66	1,492
do	1866-67	2,214

The next point which the Commission proposed to examine in regard to abortion, relates to the number and kind of cattle affected by it.

It has been suggested that a principal cause of the malady in question, might be the exclusive use of the cows for milk producing purposes, and the large quantity of this product obtained from them. In a dairy district, where the sole object of the farmer is to obtain from his cow the largest quantity and the best quality of milk which she is capable of yielding, every other consideration, of course, is made subservient to this end. The cow is raised or purchased, fed and housed for that object alone. A breed is selected, when possible, which is already known to be liberal in the supply of milk; and every means is naturally resorted to, both in the crossing of the breed and the treatment of the cattle, which is calculated to improve still further this desirable quality. It has been thought that the capacity for producing milk, cultivated in this way through successive generations, might have been increased at the expense of the generative functions; and might thus have originated in the cow a tendency to abortion. If so, the malady of which the dairy farmer now complains would be merely the result of his own success in forcing up the production of milk to too high a standard; and its only remedy would be again to reduce the production of milk to a more moderate quantity. In that case we should expect to find abortions most prevalent among cows where the yield of milk was considerably above the average.

In order to obtain information on this point, a group of questions was inserted in the blanks furnished by the Commission, in which the cows were divided into two classes, named respectively "Good Milkers," and "Ordinary Milkers." The first class comprised all cows giving more than 460 gallons of milk per year, while the second included those giving less than that quantity. The Farmers and Inspectors were desired to state, in each case, both how many of the aborting cows and how many of those carrying their calf to full term, belonged to each of these two classes. These replies were not given in all instances; but a sufficient number of them were received to lead to a very satisfactory conclusion as to the relation between them. From all the reports, taken together, the results were as follows:

Whole number of Good Milkers that carried calf to full term	35,367
Whole number of Good Milkers that aborted....	1,900
Total number of Good Milkers reported in calf.	<u>37,267</u>

Proportion of abortions to pregnancies among Good Milkers, 1 in $19\frac{1}{2}$, or a little over 5 per cent.

Whole number of Ordinary Milkers that carried calf to full term.....	7,702
Whole number of Ordinary Milkers that aborted..	477
Total number of Ordinary Milkers reported in calf,	<u>8,179</u>

Proportion of abortions to pregnancies among Ordinary Milkers, 1 in 17, or $5\frac{4}{5}$ per cent.

It appears, therefore, that there is but little

difference in liability to abortion between Good Milkers and Ordinary Milkers; but that, of the two classes, the Ordinary Milkers are rather the more subject to the disease.

It was also thought desirable to ascertain whether the occurrence of abortion were more frequent in first pregnancies than in those coming afterward. For this purpose, a comparison was made of the returns of the State of New York, which gave the following result.

Whole number of Cows in Calf.....	49,749
Whole number of Abortions	2,574

Total proportion of abortions to pregnancies, one in nineteen $\frac{3}{19}$, or about $5\frac{1}{6}$ per cent.

Whole number of First Pregnancies reported	3,870
Number of First Pregnancies with abortion.....	195

Proportion of abortions in first pregnancies, one in nineteen $\frac{8}{19}$, or a little over 5 per cent.

It appears, therefore, that there is no appreciable difference in the frequency of abortion in first pregnancies and in those of a later period.

The next point which the Commission desired to determine was in regard to the time at which abortion takes place in the affected cows. This inquiry comprises two different questions, viz.: First. At what period of pregnancy is the occurrence of abortion most frequent? and Secondly. At what season of the year does it happen in the majority of cases?

The first of these question cannot be answered so positively as the last. The reason for this is,

that the farmers either do not always know exactly when a cow is impregnated, or they do not keep any special record of the fact. If the bull runs with the herd, they only know that a cow is impregnated by her afterward proving to be with calf: and if they send her to the bull at a distance from the farm, they do not always recollect afterward the particular date. Accordingly, if a cow aborts during pregnancy, they are not always able to tell when her impregnation took place; or, in other words, how many months pregnancy had been going on. Still the answers to this question which have been received show that, so far as our observation extends, there is a very decided preponderance of abortion in certain periods of pregnancy.

The month of pregnancy, at which abortion took place, was reported in 1,180 cases. Out of this number the abortions were distributed as follows:

In the 1st month of pregnancy-----	5
do 2d do do -----	2
do 3d do do -----	24
do 4th do do -----	57
do 5th do do -----	171
do 6th do do -----	214
do 7th do do -----	288
do 8th do do -----	295
do 9th do do -----	124
Total.....	<u>1,180</u>

The sixth, seventh and eighth months, therefore, appear to be those in which abortion most frequently occurs.

With regard to the second inquiry, our infor-

mation is more definite. Although the answers to this question are not so full as could be wished, they are still sufficient to indicate very distinctly the season at which abortions are most frequently observed. The month in which abortion took place has been reported in 1,758 cases. Of these abortions, there were :

In the month of May	12
do June	12
do July	3
do August	1
do September	15
do October	56
do November	164
do December	343
do January	385
do February	405
do March	274
do April	88
Total	<u>1,758</u>

By far the greater number of abortions, therefore, take place during the months of December, January and February; February showing a larger proportion than any other month in the year.

It has been suggested that abortions may take place during the summer and early fall months, of which we have no knowledge, as the immature calves, being at that time quite small, and being dropped by the cow in the fields, might be readily overlooked. It has been thought that this would account for the fact that the first marked increase in the number of abortions, as reported, takes place in the month of November. The cows are nearly always permanently stabled for the winter, from

the first to the fifteenth of this month, and accordingly abortions taking place after this time would be necessarily noticed by the farmer, while those which happen before the first of November, might easily escape observation.

It is indeed possible that a certain number of early abortions may be overlooked from this cause. It is the belief of the Commission, however, that the proportion of such cases is not large, and that the list given above is substantially correct; since we find that, in almost every instance, the number of abortions steadily increases, after the cows have been stabled, through the months of December, January and February. In all probability, therefore, this is a natural increase, which begins early in the fall and continues throughout the winter months.

This fact naturally leads us to ask whether the cold weather, and exposure of the cattle in imperfectly constructed stables, may not have something to do with the production of the disease. We are induced to believe, however, that cold and exposure have but little influence in this direction. First, because the occurrence of abortion, as a serious malady, is of comparatively recent date, while the cattle are certainly no worse housed now than formerly; and secondly, because in those parts of the country where the exposure of the cattle is more severe than in New York, they do not suffer from abortion to a corresponding degree. In the Western and Northwestern States, as we have already seen, abortion is comparatively rare, and in these States the housing of the cattle, during cold weather

is much less complete than with us. A large proportion of the cattle, in fact, are not housed at all; being allowed to remain in the fields night and day, throughout the winter months, either entirely without protection or with only the shelter of a board fence to break the force of the more violent winds.

The following extract from a letter accompanying one of the reports, will serve to show how little effect severe weather sometimes has upon the condition of pregnant cows:

BLOOMING GROVE, OHIO, *August 22, 1867.*

J. C. DALTON, M. D.,

Dear Sir: * * * For the last three years and more we have bought milk cows and sold to the dairies north of us, on the "Reserve," from 75 to 125 head of cows each year. We generally commence buying in February, and sometimes hold them until the middle of May. The cows are bought from our neighbors in the county, and are kept in the same manner, and fed on the same feed as our own. When we get them they are turned out into an open field, and fed on hay until we sell. We generally have them in the calving season. Last February we had fifty, kept in this manner, and thirty had calves in the open fields, some in the very coldest weather. They all came at the proper time, and cows and did well. We lost but one calf, and the night was so cold it froze.

If the Report is of any benefit, I am fully paid for imparting any knowledge that will aid the Society in their laudable work, in seeking information to arrest the cause of a disease so destructive to cattle.

Very respectfully, yours,

JAMES MARSHMAN.

It is not probable, therefore, that abortion, as it exists in the State of New York, is due, in any great degree, to the influence of cold or exposure.

The same thing may be said of various other circumstances, which might be considered as important in regard to the daily care and treatment of the cows. In a large proportion of cases,

even in those counties where the percentage of abortion is large, our reports show that the pastures are amply provided with water and shade; that they are situated but a short distance from the stables, often within a quarter of a mile; that the stables are well built, above ground, sufficiently well lighted, and without serious deficiency in ventilation. There are instances, of course, where the cows are not so well cared for in these respects; but even where such imperfections exist, it has not been found possible to detect any definite relation between them and the amount of abortion on the corresponding farms. The truth seems to be this: That where a cow is already predisposed to abort, neglect or improper treatment or bodily injuries of the slightest nature, will cause the abortion to take place; but, so far as our evidence goes, when the cows are otherwise healthy the disease cannot be produced in them, to any widespread degree, by the ordinary forms of mismanagement to which cattle are exposed.

Among the particular details which have been examined, in reference to abortion, was that of *the age at which the cow is first impregnated*. In many instances it is the custom to begin the impregnation of the heifer at the age of from one year to eighteen months. Is this age too early for the healthy exercise of the generative functions? And does the premature use of the heifer for this purpose predispose her to subsequent abortion?

By a comparison of the returns from 1,453 farms the following result has been obtained:

Number of farms having *over* 5 per cent of abor-

tions (343), in which the cows are first impregnated at the age of

1 to $1\frac{1}{2}$ years.....	242, or $70\frac{1}{2}$ per cent.
2 years and over	101, or $29\frac{1}{2}$ per cent.

Number of farms having *not over* 5 per cent of abortions (1,110), in which the cows are first impregnated at the age of

1 to $1\frac{1}{2}$ years.....	805, or $72\frac{1}{2}$ per cent.
2 years and over.....	305, or $27\frac{1}{2}$ per cent.

The difference between these two classes of farms is not great; but it appears that the farms having the smaller percentage of abortions are those in which the larger proportion of the cows are habitually impregnated at the age of 1 to $1\frac{1}{2}$ years. We cannot, therefore, attribute the occurrence of abortion to a too early impregnation of the young heifer.

Next to the age of the heifers, that of the *bulls used for service* might be regarded as having a possible influence on abortions. If it were the general practice to use bulls of an insufficient age, it would not be surprising if their progeny should be liable to debility and disease, or should even fail altogether to come to maturity. In that case the cause of the abortion would be not so much in any defect of the cow, as in her incomplete impregnation by the bull. The age of the bulls used for service was therefore a point which received attention in the inquiries made by the Inspectors.

The result of these inquiries was as follows: Bulls are used for service at the age of 1 year, 2 years, and 3 years and over. By far the largest number of cows are impregnated by two year old

bulls. The age of the bulls by which the cows had been impregnated was reported in 37,948 cases; and of these, 25,554, or 67 per cent, were cases in which the age of the bull was 2 years. In 9,285 cases it was 1 year; and in 3,099 cases it was 3 years and over.

The influence of this difference on the percentage of abortions is given in the following table:

Number of Cows Impregnated by

	Bulls aged 1 year.	Bulls aged 2 years.	Bulls aged 3 years.
That carried calf to full term..	8,931	24,059	2,873
That aborted	364	1,495	226
Total.....	9,295	25,554	3,099

An examination of this table shows that of all the cows impregnated by one year old bulls, a little less than 4 per cent aborted; of all those impregnated by two year old bulls, nearly 6 per cent aborted; and of all those impregnated by bulls aged three years and over, a little more than 7 per cent aborted. If the age of the bulls, therefore, have an influence as a cause of abortion, it is certainly not because the cows are impregnated by bulls which are too young.

Is it because the bulls are used too much? In other words, does the vigor of the bull become exhausted, during the second and third years, by too frequent service?

So far as we have been able to ascertain, the number of cows usually served, in this State, by

one year old bulls, is not over twenty. The average number served during the season by two year olds is about thirty; and the number served by three year olds is about forty. We find, therefore, that the number of aborting cows corresponds very closely with the drain upon the generative powers of the bulls used for impregnating them; and this circumstance, perhaps, deserves the attention of farmers engaged in dairying or in the raising of stock. Still, the average number of cows served during the season, by even three year old bulls, does not seem to be excessive; and, without further evidence upon this point, we should not be inclined to attribute to it a very serious influence in the production of abortions.

With regard to the *symptoms* exhibited by the aborting cows, very often none whatever are perceptible beyond the mere fact of the abortion. Of 2,331 cases, in which information has been obtained on this point, 1,403, or a little over 60 per cent, showed no distinct indications of sickness, either before, during, or immediately after the abortion. In the remaining 928 cases, or nearly 40 per cent, signs of indisposition, more or less severe, were manifest. When the abortion is accompanied by illness, the symptoms are those described in the following account, which has been compiled by Dr. CARMALT from the various reports made on this subject by the Assistant Inspectors:

“The only evidence of abortion in the earlier months of pregnancy appears to be that after the cow has been served by the bull and has passed naturally over one or more periods, she is found to

be again violently in heat; which is sometimes accompanied by a considerable discharge from the vagina, consisting of glairy mucus, occasionally puriform in appearance and of an offensive smell. This condition of heat lasts longer than usual sometimes for several weeks; after which, if the cow be again impregnated, she becomes quiet. While in the excited condition above described, the supply of milk diminishes, but not to less than four-fifths or five-sixths of the usual quantity. After the second impregnation, the cow again gives her full supply.

“Later in pregnancy the aborting cow may show some premonitory symptoms of approaching trouble. Perhaps in one-half the cases it is noticed that she loses her appetite, and is either restless or unnaturally sluggish in her movements. If she has been dried off from milking, the udder will now enlarge; the vulva become swollen, and a purulent or muco-purulent discharge may flow from the vagina. The abortion usually occurs in the night; the foetus being found in the dung on the stable floor in the morning. The after-birth is usually retained for a variable length of time—from three days to six weeks or more—and is finally cast off piecemeal, accompanied by an extremely offensive, foetid, purulent-looking discharge. The cow, in these cases, loses her appetite after abortion and become emaciated and weak. The supply of milk either diminishes one-third, one-half or three-quarters, or falls off entirely. It rarely continues to the usual full amount.”

The occurrence of abortion very rarely proves fatal. From the inspection of 1,577 farms in New York and Massachusetts, reporting altogether 7,176 abortions from the year 1851 to 1867, only 50 cows are reported as having died in consequence of abortion—that is to say, one fatal case in 143 abortions. It is fair to suppose that the real proportion is even less than this, since a certain number of the abortions reported in former years were undoubtedly occasioned by accidental injuries, to which the death of the animal is in part to be attributed.

In order to learn the internal changes which take place in the generative organs at the time of abortion, Assistant Inspector RICHARD F. HALSTED, M. D., was requested to obtain for the Commission a cow, otherwise healthy, which had been the subject of abortion, and to kill her for the purpose of making a post-mortem examination. He accordingly did so in the month of January last, and communicated the result of his examination in the following report:

HERKIMER, N. Y., *January 28, 1868.*

DR. WM. H. CARMALT, *Assistant Commissioner:*

Doctor—I have the honor to report that I have this day made a post-mortem examination of a cow that had aborted on the farm of Mr. John Golden about fifteen hours previously.

The case was, to the best of my judgment, entirely without complication. The cow was in excellent condition, appearing perfectly well both before and after abortion. I opened and examined her immediately after being killed. Exteriorly the uterus was healthy. Internally I found the cotyledons of the after-birth in various stages of softening, without regard to their size, or, so far as I could discover, to their position. The foetal portion of the cotyledons was easily separated from the uterine. In some instances, even the mere handling, necessary to remove the uterus from the cow, produced this separation. In others the slightest force at the edge would turn out, so to speak, the whole foetal portion

from its uterine connections. In none was there any difficulty in separating them.

I examined about one-third of these bodies at random. The remainder were of precisely the same appearance exteriorly as the others. Their color was a whitish yellow, like that of pale adipose tissue. The consistency of the uterine portions was tolerably firm; that of the foetal portions was quite soft. The numerous tapering small tufts, which were removed from the cells of the uterine cotyledons, were generally of a fatty color and consistency. A few of them, however, had apparently passed this stage, and had become firmer and somewhat granular in texture.

The arteries and veins, proceeding from these bodies to the foetus, all seemed to be in a healthy condition. Only an inch or two of the umbilical cord could be found; the remainder having been probably lost in the stable at the time of abortion.

The calf had every appearance of being quite healthy, and none of having been dead for more than a few hours. From its appearance, I considered it to be within about a month and a half of the full term; though its weight was rather low for this age, being only eighteen and a half pounds. Its length was twenty-eight and a half inches.

The cow was a choice one, about six years old, and had always been in good condition.

There was no evidence, anywhere, of inflammatory action, past or present. I am of opinion, from all the appearances presented, that the circulation of blood had ceased in the foetal portion of the cotyledons for some days previous to the time of abortion; and that the immediate cause of the abortion was in the arrest of development thus produced.

Very respectfully,

Your obedient servant,

R. F. HALSTED, M. D.,
Assistant Inspector.

A portion of the cotyledons, removed by Dr. HALSTED in the above case, were sent to New York and examined by the microscope. No changes were found in them, except such as naturally follow from stoppage of the circulation, and a partial separation of the foetal and uterine portions from each other.

The primary cause of abortion is sometimes to be found in the *fœtus itself*. Being imperfectly organized it dies prematurely, while still in the

uterus; and the uterus then expels it as a foreign and offending substance. It was thought that we might ascertain whether this were the case in the present malady, by learning what proportion of the calves, born alive, afterward died from debility or disease. If it should be found that the fatality among calves after birth continued unusually large, it would furnish strong evidence that some original defect of organization was also the cause of the abortions.

The results of our inquiries did not show this to be the case. Of 38,654 calves born alive in New York and Massachusetts, in the year 1866-67, the number of

Those still alive in the fall and winter of 1867, was	6,125
Those which had been killed	32,199
Those which had died from debility or disease	330
Total	<u>38,654</u>

The proportion of calves dying from debility or disease was therefore only 1 in 117 of those born alive during the year. But as the proportion of aborting cows to the whole number of those in calf is 1 in 19, it is plain that there is no definite relation between the occurrence of the present form of abortion and an original defect in the constitution of the abortive calves,

It is a question of some practical importance to determine whether abortion be especially *liable to recur* several times in the same cow; or whether a cow, having once aborted, is afterward free from

the disease. In order to ascertain this, inquiry was made as to how many, both of the aborting and fruitful cows, had aborted or had carried their calf to the full term, during the previous year. The following is the result:

No. of cows carrying calf to full term, that had aborted the previous year	507
No. of aborting cows that had aborted the previous year	143
Total number of cows that had aborted the previous year	650

Of these 650 cows, therefore, that aborted in 1865-66, and that were again in calf the following year, 143, or exactly 22 per cent aborted in 1866-7. But as the ordinary proportion of aborting cows, in the State of New York, is only a little over 5 per cent, it follows that a cow, after one abortion, is four times as likely to lose her calf the following year, as if she never had been affected with the disease.

A point of some importance in the treatment of the cows is that relating to *the time at which the young calf is separated from its dam*. The practice varies somewhat in this respect. Sometimes, when the calf is to be raised, it is allowed to remain constantly with the cow for some days, and is afterward permitted to suck night and morning, for six weeks or more. Sometimes it is permanently separated at from two days to three weeks; and in many instances it is taken from the dam immediately after birth, never be allowed to suck at all, and being either raised for a time on artificial food,

or killed at once for the skin, while all, or nearly all the milk is retained for dairy purposes.

It has been thought that a too early separation of the calf might have an injurious effect upon the cow in predisposing her to subsequent abortions. Being at once deprived of her progeny, and prevented from exercising the ordinary functions of nourishing her young, the impression produced by this deprivation might affect the nervous system to such an extent that in subsequent pregnancies it might manifest itself by inducing abortion. In order to ascertain how far this might be the case, the proportion of farms in which the calves were habitually separated from the cows at an early day was compared with those in which the separation was deferred until a later period. The number of farm having over 5 per cent of abortion in which the practice in this respect was reported, was 372; the number of those having not over 5 per cent was 1,130. The result of their comparison was as follows:

Number of farms having *over* 5 per cent of abortions (372) in which the calf is separated from the cow

Within two days after birth, 108, or 29 per cent.

After two days ----- 264, or 71 per cent.

Number of farms having *not over* 5 per cent of abortions (1,130) in which the calf is separated from the cow

Within two days after birth, 440, or 39 per cent.

After two days ----- 690, or 61 per cent.

In those farms, accordingly, which have the smaller percentage of abortions, the calf is most

frequently separated from the cow within two days after birth. So far as regards the liability to abortion, this result is favorable to an early separation of the calf, rather than to allowing it to remain with the cow for a longer period.

A fact of much interest has been developed in the course of the last few months, during the examination of the abortion returns, which deserves to be spoken of by itself; that is the extremely *local character* of the malady, and the narrow limits within which, in most cases, it is confined.

Early in the Fall it was found, by a comparison of the farmers' reports received from Massachusetts, that there were several towns in that State, in which the percentage of abortion was very high; and that these towns, in some instances, lay directly contiguous to others which were entirely free from the malady, or in which its percentage was so low as to be practically unimportant. Thus, in Worcester county, the town of Hardwick reported 50 abortions among 267 pregnant cows, or nearly 19 per cent; while in the town of Barre, next north-east from Hardwick, there were no abortions in a total of 83 pregnancies. The towns of West Brookfield and Brimfield, lying a little farther south, both reported abortions to the amount of over 15 per cent; while the town of Warren, situated between the two, had only 4 per cent. In the more eastern parts of the State, Shrewsbury, with 40 per cent of reported abortions, was contiguous to Boylston, with none at all; and Harvard, with 11 abortions out of 15 pregnancies, lay next to Lancaster, with 15 pregnancies and no abortions. In Greenfield,

Franklin county, there were over 20 per cent of abortions reported; and in the adjoining town of Shelburne only two per cent, and in that of Deerfield none at all.

It was hoped that by a careful inspection of these towns, so closely adjacent and yet so different in their percentage of abortion, some distinct peculiarities might be detected, either in their physical situation, the quality of their soil, or in the breeding or treatment of their cattle, which might throw a valuable light on the causes, or at least the occasion of the malady.

Accordingly, Assistant Inspector, Dr. HENRY E. HANDERSON, was deputed to visit the towns in question, situated in Worcester county, and to make of them a thorough and detailed examination, in order to determine the two following points, viz.:

First—Whether these local peculiarities existed, in each case, throughout the entire township, or were confined to particular farms; and

Secondly—What was the apparent cause, either in the physical situation of the towns or farms, or in the breeding or treatment of the cattle, to account for such marked differences in the proportion of abortions, in places so closely adjacent to each other.

Dr. HANDERSON performed this duty in a most faithful and judicious manner. He inspected the five towns of Hardwick, Barre, Oakham, New Braintree and West Brookfield; and presented on his return a report embracing a large number of highly valuable facts and observations on the subject assigned to him for investigation. It was shown,

in the first place, that a striking difference really existed in the abortion percentage of the above towns. Taking Dr. HANDERSON's report in connection with those previously received from the farmers, it appeared that in Hardwick there were 114 abortions among 587 pregnancies, or 19 per cent. In the adjoining town of Oakham there were no abortions among 79 pregnancies. In New Braintree, between Oakham and Hardwick, there were but 23 abortions in 467 pregnancies, or less than 5 per cent; and in West Brookfield, next south of New Braintree, there were 41 abortions in 208 pregnancies, or nearly 20 per cent.

An examination of the separate reports showed that the abortion malady was also very irregularly distributed among the different farms. In West Brookfield, for example, where the percentage of abortion for the whole town was higher than in any other, there were ten farms, reporting 107 pregnancies, or more than half the whole number, in which there was not a single case of abortion; while on three of the remaining farms the proportion was respectively, 28 per cent, 34 per cent, and 56 per cent. In New Braintree, with a general proportion of less than 5 per cent, there was one farm showing 22 per cent, and two farms showing 14 per cent each; while there were, beside, thirteen farms without a single case of abortion. It is not therefore, the entire town which is infested with the abortion malady, but only particular farms situated within its limits.

Dr. HANDERSON says in his report, "In Oakham, I could find *no* well established case of the epidemic,

either from report or from my own investigations. By reference to the rough map accompanying this report, it will be seen that the disease in Hardwick is principally confined to the southeast portion of the town. I do not intend by this that it does not exist in other portions of the town, but that elsewhere disease is the *exception*; in the southeast corner it is the rule. In West Brookfield, two of the undoubted cases of the epidemic are in the northwest corner, just at the point nearest to the town of Hardwick. In New Braintree, the disease is more sporadic, though still showing a tendency to aggregation. In Barre, the only two undoubted instances of the disease are distant from each other perhaps a mile. In all the towns, infected and uninfected farms lay side by side, though this is less true in Hardwick than elsewhere."

The same thing is true in the State of New York. If we take Oneida county, where the average proportion of cases is $3\frac{1}{2}$ per cent, we find that in three towns it is 6 per cent or over, and in nine towns it is less than 2 per cent. In Herkimer county, with a general proportion of $5\frac{1}{2}$ per cent, the town of Newport gives 11 per cent, and the town of Fairfield 12 per cent; while there are four towns giving from 5 to 8 per cent, and eight towns giving less than 5 per cent.

If we examine particular farms, the difference is still more marked. In the town of Litchfield, Herkimer county, giving a general proportion of 6 per cent, there are three farms upon which the proportion is respectively 44 per cent, 46 per cent, and 63 per cent; while there are forty-seven farms

upon which there is not a single case of abortion in 1,046 pregnancies.

In Winfield, Herkimer county, the general proportion is only $2\frac{1}{2}$ per cent. But there is one farm where it is 10 per cent, one where it is 14 per cent, two upon which it is 15 per cent each, and one where it is 25 per cent; while there are thirty other farms, giving altogether 687 cases of pregnancy, and no abortions.

In the town of Danube, Herkimer county, the general proportion is a little over $5\frac{1}{2}$ per cent. There are, however, eight farms in which it is from 2 per cent to 10 per cent, and eleven farms in which it is above 10 per cent. Of these farms, one has 36 per cent, one 38 per cent, one 45 per cent, one 52 per cent, and one 66 per cent; while there are fifty-eight farms in the township which are entirely free from the malady, reporting altogether 1,635 pregnancies, and not a single abortion.

During a tour of examination made in Otsego county last summer, the Assistant Commissioner, Dr. CARMALT, inspected, among others, eight farms, situated in the towns of Springfield and Middlefield, and all lying within a space of two and one-half miles radius. No one of these farms had less than 22 cows in calf during the year 1866-7, and the average number for each was a little over 32. In four of these farms there were no abortions in 141 pregnancies; one of them had 6 per cent of abortions, and the remaining three had 18 per cent each. One of the farms occupied by Mr. THERON WICKHAM, in which the abortions were 18 per cent, is only half a mile distant from the "Gil-

christ" farm, occupied by Mr. ERASTUS HANOR, in which there were no abortions. At a distance of one mile from the "Hyde" farm, the residence of the proprietor, Mr. GEO. CLARKE, upon which there were no abortions, is the farm occupied by Mr. ALBIN GENTER, in which the abortions were 6 per cent; and next adjoining the Genter farm, is that occupied by Mr. ABRAHAM WOLEBEN, upon which there were no abortions in a total of 51 pregnancies.

There are points in the previous history of these forms equally remarkable. The "Hyde" and "Gilchrist" farms, though now free from the malady, were affected by it from the year 1860-1 to about 1863-4; and during this period the abortions upon these two farms amounted to from 7 per cent to 33 per cent of the pregnancies. The farm occupied by Mr. JOHN DUTCHER joins the "Hyde" farm on the south and the "Gilchrist" farm on the east; but upon Mr. DUTCHER'S farm there has not been a single case of a ortion for the last fifteen years—the size of the herd varying from ten to thirty cows.

It is plain, therefore that the malady of abortion, whatever may be its nature, is one which is extremely local in character—not extending in the same degree over wide tracts of country, but restricted within narrow limits in various localities. In other words, *Abortion does not exist anywhere as an epidemic*; certainly not in the State, nor in any county of the State; nor even, so far as we have been able to ascertain, in any one of the towns. It is confined, in the great majority of instances, to particular farms; and in these farms

it appears and disappears, increases or diminishes, without reference to the condition of the herds upon other farms in their immediate vicinity.

This peculiarity in the distribution of cases of abortion was not anticipated at the commencement of the present investigation; and the Commission cannot but regard it as an extremely important feature of the malady, and one which must be fully considered in any attempt to determine its nature and its cause. It explains why we have thus far failed to detect the cause of abortion in any of the general conditions of breeding or treatment which we have investigated. The occurrence of abortion does not seem to be regulated by any of these conditions; but appears to depend upon some cause which is much more local and limited in its operation.

As soon as this fact is established, the idea naturally presents itself that we should endeavor to seek the cause of the difficulty in some physical peculiarity of the affected farms. If two farms lie side by side, in one of which abortions are frequent, while in the other they are rare, or do not happen at all, may we not hope to find some decided differences in their situation, their high or low level, the character of their soil, or in the feeding or treatment of the cattle upon them, which may account for this variation in their results?

It was in order to ascertain this point, as already mentioned, that Dr. HANDERSON was directed to make a special inspection of the towns in Massachusetts where this strongly marked local difference was first noticed. The result of his examination

in this respect was very decided. Dr. HANDESON speaks in his report as follows ;

“The physical features of the five towns inspected are essentially the same. An endless succession of hills, more or less rocky, separated by winding valleys, interspersed with numerous fresh-water ponds, make up the totality of the physical situation. Barre and the eastern portion of New Braintree are, perhaps, rather less hilly, but the difference in this respect is not very noticeable. The soil is generally a sandy loam, by no means productive naturally, and the timber is, in general, small and stunted oaks and pines. The farms are small and the dairies average about sixteen cows only. Cheese factories have been introduced within the last two or three years, but are not nearly so numerous as in New York. In spite, however, of the unattractive physical features of this section, the farmers as a rule seem well-to-do and comfortably situated. The stock is also, as a rule, I think, better cared for than in the portions of New York which I have inspected. The practice of ‘deaconing’ calves, when one or two days old, is almost unheard of, the market for veal being always active, and usually remunerative. Considerable stock is also raised, and farmers are thus led to take more pains in the improvement of the breed of cattle. Almost all the stock is more or less mixed with Durham blood. The hay of section is inferior in quality to most of that fed in New York, and corn-fodder, straw, and husks of corn are fed to a greater extent. The stables are generally good ; and, so far as observation extended, are generally

kept in good order. In other respects, I do not know that the management of farms in Massachusetts differs essentially from the course pursued in this State.

“Turning then to the specific questions, the investigation of which was the direct object of my mission, I find them to be these :

“First. Whether these local peculiarities exist, in each case throughout the entire township, or are confined to particular farms ; and

“Secondly. What is the apparent cause, either in the physical situation of the towns or farms, or in the breeding or treatment of the cattle, for such marked differences in the proportion of abortions, in places so closely adjacent to each other.

“By the ‘local peculiarities’ referred to in the first question, I presume is intended the relative presence or absence of the disease. In reply to this question, I should say that none of the towns in this neighborhood, except Oakham, are entirely free from abortion ; but that the disease is local, and that it is confined to a few farms, in all of them except Hardwick. Even in this town, as has already been stated, the principal violence of the disease is expended upon the southeast portion.

“In answer to the second question, viz., the cause of the disease, I must express my decided opinion that it does not depend, to any material degree, upon either physical situation, or the breeding or treatment of the cattle. Infected and uninfected farms lay side by side in almost every instance where I have met the disease. A marked example of this fact is seen in the condition of the

farms in the northwest corner of West Brookfield. The physical situation of all these farms may be said to be nearly identical; yet uninfected farms exist there bounded on *both* sides by other farms upon which the disease rages with considerable violence. Moreover, that the disease is entirely independent of physical situation is manifest from the fact that in those rare cases where the infected herd has been sold off entirely and replaced by healthy stock from a distant neighborhood, the disease has disappeared even upon the same farm. Such examples are very uncommon, but their testimony seems to me direct and positive. Are we then to look for the origin of the disease in the mode of breeding, or treatment of the cows? I must express my total inability to discern any appreciable difference in this respect between the healthy and the infected farms. That abuse of cattle will occasionally produce an abortion is very manifest, both from theory and the history of almost any inspected farm; but that even wholesale abuse will occasion the phenomena of this epidemic seems to me inconsistent with both reason and fact, as recorded in my reports."

The Assistant Commissioner, Dr. CARMALT, was led to the same conclusion by the result of his special inspection of the farms of Mr. GEO. CLARKE, in Otsego county, N. Y. I am authorized to say that he could detect no decided peculiarities, either in the physical condition of contiguous farms, or in the daily treatment of the cattle thereon, which could account, in any satisfactory manner, for the difference in their percentage of abortions.

It appears, accordingly, that the cause of abortion is local, and connected in some way with the farm itself; and yet that it does not depend upon character of physical situation, nor upon the details of breeding or treatment of the cattle. To what source, therefore, can it be attributed?

The Commission would desire to speak upon this point with great reserve, since we do not believe that sufficient information has yet been obtained to warrant the expression of any decided opinion. Still it is thought that this portion of the subject should not be passed over in silence, as its mention may be of some practical benefit, and as the Society has a right to all the information, however scanty, which the Commission may have succeeded in obtaining.

We would say, therefore, that there is evidence, to a certain extent, that the malady of abortion is frequently brought into farms, in the first instance, by *importation*. It is not by any means certain that this is always the case; for there are some instances in which the disease has appeared without our being able to trace it to any external source. But there are also many cases of an opposite nature; and on the whole, the most noticeable general distinction between affected and unaffected farms appears to have been this: that the disease is more likely to show itself where the stock is habitually replenished by purchase from other farms, or from droves passing in the vicinity, than where it is raised upon the farm itself, under the immediate care of the owner.

Dr. HANDERSON speaks on this point as follows :

“In all my investigations of the history of the epidemic upon special farms, I have avoided, so far as practicable, all leading questions, preferring to suggest little or nothing to the farmer’s mind. My usual question was “Where did you get the first cow which aborted upon your farm?” The usual history of infected farms ran something like this: One or more abortions might have occurred at different periods within the last seventeen years, but no two in any one year, nor in any two successive years. These aborting cows were sometimes sold or killed, and sometimes retained, but no manifestations of disease followed. Finally, within the last three or four years a cow was bought in calf, either from a farm ‘healthy, so far as known,’ from a drove, or from a farm known to be infected. She aborts her calf; and if this takes place early in the fall, other abortions usually follow in the spring. But if this first abortion occurs in the spring, the other cows ordinarily carry their calves to full term for that year, but abort in the following fall and winter. Sometimes a single abortion only occurs for two successive years, and the presence of the epidemic is not manifested until the third year, when a number of abortions show the influence of the disease. In many cases, on endeavoring to trace the history of the farm, said to be ‘healthy, so far as known,’ from which the original aborting cow was obtained, I was unable to get satisfactory information, in consequence of frequent change of owners, or failure of memory on their part. In a few, no history of disease could be

obtained; in quite a number a number, evidence of the disease had been manifested either before or very soon after the sale of the offending cow. The precise point, however, to which I wish to direct attention, is the comparative rarity of first abortions in cows *raised* upon the diseased farm. Auction sales of infected herds seem to have been fruitful sources of the disease. This fact of the appearance of the disease upon a previously healthy farm soon after the advent of a cow from an infected farm, or from some farm whose previous condition cannot be ascertained, and this strange cow being the first to abort, is the chief peculiarity which has been observed in the history of the disease. Many instances of this kind will be found in my reports, and I will only refer to the reports of Mr. DELAHUNTY, of West Brookfield; Messrs. WILCOX, G. N. BUSH, and JOSEPH WOODS of New Braintree; CALVIN MANN, J. W. POWERS, and FREDERICK D. RUGGLES, of Hardwick, and LEMUEL RICE, of Barre.

Upon the farm of Mr. CALVIN MANN, above referred to, in the year 1866-67 there were 8 abortions among 19 pregnancies, or 42 per cent. The disease had first appeared in the previous year, viz., 1865-66; when there were 4 abortions in 18 pregnancies, or 22 per cent. The first cow which aborted had been obtained by exchange from Mr. DWIGHT FISK, who had the disease upon his farm at that time. Mr. FISK stated that he, in his turn, first got the disease from a cow which he had bought in December, 1864, from another farm,

then occupied by Mr. MANN, and upon which 4 abortions occurred that year.

On the farm of Mr. J. W. POWERS, in 1866-67 there were four abortions in 12 pregnancies, or 33 per cent. In the year 1865-66 there had been 7 abortions in 8 pregnancies, or $87\frac{1}{2}$ per cent; and in 1864-65, the first year of the disease, there were 2 abortions in 15 pregnancies, or 13 per cent. Previously to that time there had been no abortions for at least fourteen years. The report states that, "most of the cows upon this farm have been bought. They have usually been driven to neighbors' bulls. The first cow which aborted (in 1864-65) was bought in December, 1864, of Mr. CALVIN MANN, who had the disease upon his farm at that time. She aborted in the following January, and in another month a second cow, bought at the same time and place, also aborted. Both these cows were fatted and killed; one in April, 1865, and one in the fall of the same year. The first cow which aborted in 1865-66 had been raised upon this farm, and served by a bull from a healthy farm.

On the farm of Mr. WM. DELAHUNTY there were, in the year 1866-67, 9 abortions in 25 pregnancies, or 36 per cent. The disease had also appeared the previous year, viz: 1865-66, when there were 5 abortions in 18 pregnancies, or 28 per cent. The report states as follows:

"Mr. DELAHUNTY bought this farm in August, 1865, of Mr. SIDNEY ADAMS. Two cows, already in calf, were bought upon the farm, and in the following November Mr. DELAHUNTY moved all his stock

down to this farm. In January, 1866, one of the two cows which had been bought with the farm aborted, and soon afterward the other purchased cow, and *three* of Mr. D's own stock also aborted. Mr. D. has since been told by the former owner, that abortions had occurred upon this farm before the time of its purchase by him. Of the nine cows that aborted in 1866-67, Mr. DELAHUNTY has sold all but one; this one is still on the farm and has not yet aborted, though now in the eighth month of pregnancy. Since May, 1867, Mr. DELAHUNTY has had four abortions, all occurring in cows bought this year, all coming from separate towns, and from farms upon which no disease existed, so far as known."

Dr. CARMALT's special report of his inspection in Otsego county shows some important facts of a similar nature. This inspection was made upon thirteen farms, all belonging to the same proprietor, Mr. GEORGE CLARKE, and situated in the towns of Springfield, Middlefield, Cherry Valley and Milford; eleven of them being leased to tenants, and the remaining two conducted under Mr. CLARKE's immediate supervision. It was upon these farms that the disease first made its appearance in Otsego county; and Dr. CARMALT directed his attention especially to them, because he hoped that it might thus be possible to determine the origin, and trace the cause of the disease with more certainty than elsewhere, where farms are each owned by a separate person, farming it himself and having indefinite relations, in regard to changes of stock, with his neighbors.

The history of the malady upon these farms, as given by Dr. CARMALT in his report, shows the following facts:

“According to the statements of Mr. CLARKE, ANDREW McLEAN, and W. M. SMITH, abortions first occurred among Mr. CLARKE’s herds, at the ‘Gilchrist’ farm, in July, 1860; during which year 33 per cent of the pregnant cows were affected. Two or three of these aborting cows were thoroughbred Herefords. The others were grade Herefords; and all were large, well-nourished and otherwise healthy animals. More or less changes were always taking place previous to this sudden eruption of the disease; but it was not thought that any cows had been introduced from a dairy or district where abortions were prevailing. Indeed, this was the first appearance of the disease affecting a herd generally, anywhere in this section, so far as I could learn; nor could I trace anything that would seem to be a sufficient cause to produce it, in this way, in an apparently perfectly healthy stable and herd. The bull ‘Cronkhill,’ who got the aborted calves, was a thoroughbred Hereford that had been used for some years by Mr. CLARKE, and I believe raised by him; and was a large, strong, healthy animal. There had been no changes introduced in the manner of stabling or feeding; and, so far as I could learn, the hay was of the same kind and quality and cured as usual.

“The following year, 1861, the disease affected this herd again; 6 abortions occurring out of a herd of 40, or 15 per cent. From that time down to last year the disease had gradually decreased until

it ceased altogether, and this year the farm is entirely free from it.

“The year following the first outbreak of the disease upon the ‘Gilchrist’ farm, *i. e.*, in 1861, it appeared at the adjoining farm of ‘Hyde’; 5 cows aborting out of a herd of fifty, or 10 per cent. There had always been more or less intercourse between these two stables and herds. The next year 10 abortions occurred out a herd of 73. The two following years 5 or 6 calves were lost, the size of the herd remaining about 70. The disease then disappeared from this farm, and has not shown itself there again.

“Upon the farm occupied by JOHN McCARTHY, situated about one mile to the eastward, the disease appeared in 1862; two abortions occurring out of a herd of 40. One of these aborting cows had come from the ‘Hyde’ farm. The following year 6 cows out of 34 were affected, and the loss has continued about the same ever since. The occupant of the farm has always endeavored to get rid of an aborting cow, and to fill up by purchase, either from the neighbors generally, or from some other of Mr. CLARKE’S farms.

“About one mile from McCARTHY’S is the farm cultivated by JOSEPH HOEY, who has held possession since 1860, but who escaped the disease until 1865–66, when he lost eleven calves out of a herd of 21; and this year, 1866–67, he has lost 6 out of 22. He has had cows from Hyde at various times, and reports that until two years ago he bought into and sold cows from his dairy whenever he needed them.

“A little over a mile from Hyde is the farm occupied by ABRAHAM WOLEBEN, who has been upon it since 1852. He has kept about 35 cows until 1861, when his dairy was increased to about 50; getting the increase of stock in part from Mr. CLARKE, and in part elsewhere. He has only had occasional abortions, which he always thought could be traced to injuries received. He has always raised his cows from calves upon the place, and has tried to improve his stock for his own use.

“On the farm cultivated by JOHN DUTCHER, in Springfield, there has been no case of abortion for fifteen years, although it lies contiguous to both the ‘Hyde’ and ‘Gilchrist’ farms. The cows are all raised upon the farm from calves, and have always remained there. Mr. DUTCHER has tried to improve his stock by using thoroughbred or highly graded bulls, and keeping his best heifers and cows for breeding; and he has allowed but little and only casual intercourse with his neighbors’ herds.

“Upon the farm cultivated by LUCIEN HINDS, about the year 1864, there were 20 abortions among 50 cows. All these twenty aborting cows had been brought from another farm some miles distant, upon which abortions had been troublesome for some years past. Since that time the disease has increased, and during the year 1866-67 there were 26 abortions out of 34 pregnancies, or over 75 per cent. Mr. HINDS raises no calves to keep up his dairy, but buys all about the country.

“In the town of Middlefield is the farm cultivated by Mr. DANIEL LEONARD. He has never had any abortions on his farm. He has raised his present

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stock himself, and does not purchase his dairy cows at all. His bulls have generally been half-breeds of different kinds, at present half-bred Ayrshire ; and are kept separate from the cows. * * *

“In reviewing the reports of these different farms, it will be seen that upon seven of them the disease has appeared with considerable severity, and in successive years ; while of the others, four have entirely escaped, and one has, for the first time, this year had two abortions, both of which were of doubtful nature.

“All seven of the herds included in the first list have been made up by purchases about the country at large, and have afterward been subjected to continued changes among themselves ; while in the remaining five, nearly all the cows are reported to have been raised on the place, or subjected to but one removal, and have been kept continuously upon the same farm for a number of years.

“While from this classification I am not prepared to say that if a cow be kept on one farm all her life, she will not abort, nor if a cow be subjected to many changes of residence or companions, that she will abort ; yet it does seem fair evidence, so far as a limited number of cases may be relied on, that the number of abortions in any given herd is increased by such continual changes ; and it should also have some weight in considering the best means of preventing the recurrence of the malady.”

This finishes the evidence, on the subject of importation. It will be seen that the Commission has obtained no information in regard to one of the

possible sources of abortion suggested by the Society, viz.: the occurrence of ergotized grass, or other deleterious plants, in the food of the affected cattle. No attempt has been made in this direction, for the reason that it was thought that such inquiries would not be attended with advantage, until we had acquired a more definite knowledge of the particular location of the disease.

The results obtained by the Commission, so far as it has been able to extend its investigations, may accordingly be summed up as follows:

1. Abortion exists, as a serious malady, in some parts of New York and Massachusetts, and in one or two localities in Pennsylvania. It is very rare or entirely absent, in Ohio, Illinois, Michigan and Iowa.

2. In New York, the annual number of abortions among cattle has considerably increased since the year 1860-61. At present the number of abortions for the entire State is about 5 per cent of the whole number of cows in calf.

3. Abortion is not proportionate in frequency to the quantities of butter or cheese produced in the affected district.

4. It is not more prevalent among good milkers than among ordinary milkers.

5. It is not more common in first pregnancies than in subsequent ones.

6. It happens most frequently in the sixth, seventh and eight months of pregnancies, and in the months of December, January and February.

7. In all probability, it is not due to exposure to cold, or to insufficient stabling of any kind.

8. It is not more prevalent among cows impregnated at the age of one year or eighteen months, than among those impregnated at a later period.

9. It is more frequent among cows which have been impregnated by two and three year old bulls, than among those impregnated by yearling bulls.

10. It is not due to inflammation of the uterus, nor to any marked change in the generative organs, other than a stoppage of the circulation and arrest of developement.

11. It is probably not owing to any defect in the original formation of the foetus.

12. Aborting cows are more liable to abort the following year, than others which have never been affected.

13. The early separation of the calf from the cow does not seem to have any injurious influence in producing subsequent abortions.

14. Abortion is a disease which is extremely local in character, and confined, for the most part, to particular farms.

15. The large majority of farms, even in the affected districts, are free from the disease; while upon a few farms the percentage of abortion is high, and the disease destructive in its effects.

16. Affected and unaffected farms often lie mingled together in close proximity; there being no marked difference in their physical situation, or in the treatment of their cattle, to account for the difference in the prevalence of abortions.

17. It is probable that abortion is, in many instances, imported into the affected farm by cows

purchased while in calf, coming from infected districts, or even from localities where the disease is not known to exist.

At the request of the Society, we have also made inquiries in regard to the practice of *spaying* cows, and the effect of this operation upon the duration and quantity of the milk supply. The result of this investigation, however, has been entirely negative. Inquiries were made by the Inspectors upon 871 farms, situated in 38 different towns, in the counties of Oneida, Otsego, Herkimer, Lewis, and St. Lawrence; and in no instance did they find that the operation of spaying had been put in practice upon the inspected farms.

The expenses of the Commission have been as follows :

Printing and Stationery	\$380 45
Postage	549 00
Express charges and telegrams.....	9 18
Maps and diagrams.....	44 27
Cow for post-mortem examination....	20 00
Salary of Ass't Inspectors for 15½ months, at \$100 per month	1,550 00
Current expenses of the above	1,691 72
One Ass't Inspector on special duty..	150 00
Current expenses of the above.....	78 64
Traveling expenses of the Commis- sioner	16 50
Traveling expenses of the Assistant Commissioner	36 51
Two acting Ass't Inspectors ½ month each	100 00
Salary of Assistant Commissioner, 9½ months, at \$1,000 per year	791 00
Total.....	<u>\$6,417 27</u>

The gentlemen who have acted as Assistant Inspectors under the Commission have performed their duties with great industry and fidelity, visiting a wide extent of country, and doing a large share of continuous and fatiguing labor. The especial acknowledgments of the Commission are also due to the Assistant Commissioner, Dr. CARMALT, without whose aid it would have been impossible to arrange and tabulate the large quantity of material comprised in the separate reports.

Respectfully submitted,

J. C. DALTON, M. D.,

Commissioner.

(A.)

REPORT OF THE

Farm cultivated by Mr.

in the Town of

County of

State of

Number of Calves born alive at full term, from May 1, 1866, to May 1, 1867, .

Number of abortions occurring from May 1, 1866, to May 1, 1867, .

Total number of cows in calf, from May 1, 1866, to May 1, 1867, .

	BREED OF COWS.					
	Devon.	Short-horn.	Ayrshire.	Alderney.	Native.	Total.
No. of cows that carried calf to full term						
No. of cows that aborted..						
No. of abortions occurring in the		No. of abortions occurring in the month of				
1st month of pregnancy...		May				
2d do do ...		June				
3d do do ...		July				
4th do do ...		August				
5th do do ...		September				
6th do do ...		October				
7th do do ...		November				
8th do do ...		December				
9th do do ...		January				
		February				
		March				
		April				
Total		Total				

DESCRIPTION OF BULLS USED FOR SERVICE.

	Breed.	Thoroughbred or mixed.	Age (years).	Weight (pounds).
Bull No. 1...				
Bull No. 2...				
Bull No. 3...				

(In case only one bull was used, place the description after "Bull No. 1.")

NUMBER OF COWS IMPREGNATED BY

	Bull No. 1.	Bull No. 2.	Bull No. 3.	Total.
That carried calf to full term ...				
That aborted				

NUMBER OF COWS THAT WERE

	GOOD MILKERS.	ORDINARY MILKERS.		
	Giving more than 460 gal- lons per year.	Giv'g less than 460 gal'ns per year.	First pregnancy.	Total.
That carried calf to full term....				
That aborted				

Number of aborted calves born dead or diseased looking
 Number of aborted calves born alive and healthy looking, ac-
 cording to age

Total

Number of aborting cows that were sick immediately before,
 during, or after abortion
 Number of aborting cows that were *not* sick immediately be-
 fore, during, or after abortion.....

Total

What symptoms does the cow exhibit when sick before, during, or after abortion; as to appetite, emaciation, stupor or restlessness, unnatural discharges, or other particulars?

PREVIOUS HISTORY OF THE EPIDEMIC UPON THIS FARM.

(Carry the record back as far toward the year 1850 as it can be done correctly.)

From May to May in the year.	Number of calves born alive at full term.	Number of abortions.	State below whether any changes, and if so, what, have been made during this period in the breed of cows used, their feeding, stabling or other treatment, or in the kind of bulls used for ser- vice, or any other particu- lars, and at what time such changes were introduced.
1850-51....			
1851-52....			
1852-53....			
1853-54....			
1854-55....			
1855-56....			
1856-57....			
1857-58....			
1858-59....			
1859-60....			
1860-61....			
1861-62....			
1862-63....			
1863-64....			
1864-65....			
1865-66....			

Have the cows on this farm ever died in consequence of abortion; and if so, how many, and in what years?

Are the cows on this farm used for producing milk or for stock raising?

How soon after birth is the calf separated from the cow?

In what month of pregnancy are the cows dried off from milking?

At what time in spring are they turned out to pasture?

At what time in fall are they stabled?

Is the pasture amply provided with shade for cows?

Is the pasture amply provided with water accessible to cows?

How far from stables to pasture?

Are the stables above or below ground?

Are the stables dark or well lighted?

Are the stables well or imperfectly ventilated?

Are the stables comfortably warm in winter?

Are the cows in winter allowed to roam in stable yard during the day, or confined in the stable?

If confined, how often and for how long are they let out into yard?

While in stable, how are they fastened in the stall?

How many feet of space, from side to side, allowed to each cow?

Is the stable yard amply supplied with water accessible to cows?

Upon what kind of hay are the cows fed?

Is the hay raised on the farm or purchased, and if so, where?

How much salt is given, and how often, to each cow?

What root crops given, and how much, to each cow?

What ground feed given, and how much, to each cow?

Are the pregnant cows fed on their own buttermilk or cheese-whey?

If so, which, and how much daily to each cow?

DATE,

1867.

SIGNATURE,

(Please answer all the above inquiries so far as practicable, whether you have had any cases of abortion or not; as negative replies are equally valuable in this investigation with those which are affirmative.)

(B.)

ADDITIONAL REPORT OF THE

Farm cultivated by Mr.

in the Town of

County of

State of

At what age are the cows on this farm usually impregnated for their first pregnancy?

OF ALL THE COWS ON THIS FARM, IN THE YEAR 1866-67, THAT CARRIED CALF TO FULL TERM—

How many were cases of first pregnancy?

How many had borne a calf at full term the previous year?

How many had aborted the previous year?

Total.

OF ALL ALL THE COWS ON THIS FARM, IN THE YEAR 1866-67, THAT ABORTED—

How many were cases of first pregnancy?

How many had borne a calf at full term the previous year?

How many had aborted the previous year?

Total.

How many calves born on this farm in the year 1866-7 are still alive?

How many were killed?

How many died from debility or disease?

Total.

How many cows in all were served during the year 1866-7, by Bull No. 1?

How many cows in all were served during the year 1866-7, by Bull No. 2?

How many cows in all were served during the year 1866-7, by Bull No. 3?

(Ascertain the above facts by inquiring of the owner of each bull.)

How many cows altogether on this farm have been subjected to the operation of Spaying?

How many died from the operation?

How many survived the operation?

Of those that survived,

How many ceased giving milk immediately after the operation?

How many ceased giving milk within one year after the operation?

How many continued to give milk for one year after the operation?

do	do	do	two years after the operation?
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do	do	do	three years after the operation?
----	----	----	----------------------------------

do	do	do	four years after the operation?
----	----	----	---------------------------------

do	do	do	five years after the operation?
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(Insert here any further information which may be obtained in regard to the above subject.)

DATE, 1867.

SIGNATURE,

M. D.,

Assistant Inspector.

